INDIANA DEPARTMENT *of* EDUCATION

2023 INDIANA ACADEMIC STANDARDS
SCIENCE

GRADE 3

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Indiana Academic Standards Context and Purpose

Introduction

The Indiana Academic Standards for Grade 3 Science are the result of a process designed to identify, evaluate, synthesize, and create high-quality, rigorous learning expectations for Indiana students.

Pursuant to Indiana Code (IC) 20-31-3-1(c-d), the Indiana Department of Education (IDOE) facilitated the prioritization of the Indiana Academic Standards. All standards are required to be taught. Standards identified as essential for mastery by the end of the grade level are indicated with the word “Essential” under the standard number.

The Indiana Academic Standards are designed to ensure that all Indiana students, upon graduation, are prepared with essential knowledge and skills needed to access employment, enrollment, or enlistment leading to service.

What are the Indiana Academic Standards and how should they be used?

The Indiana Academic Standards for Grades K-12 Science are based on *A Framework for K-12 Science Education* (NRC, 2012) and the Next Generation Science Standards (NGSS Lead States, 2013). The following conceptual shifts reflect what is new about these science standards. The Indiana Academic Standards for Science:

- Reflect science as it is practiced and experienced in the real world;
- Build logically from kindergarten through grade 12;
- Focus on deeper understanding as well as application of content; and
- Integrate practices, crosscutting concepts, and core ideas.

The K-12 Science Indiana Academic Standards outline the knowledge, science, and engineering practices that all students should learn by the end of high school. The standards are three-dimensional because each student performance expectation engages students at the nexus of the following three dimensions:

- **Dimension 1** describes scientific and engineering practices.
- **Dimension 2** describes crosscutting concepts, overarching science concepts that apply across science disciplines.
- **Dimension 3** describes core ideas in the science disciplines.

Science and Engineering Practices (*as found in NGSS*)

The eight practices describe what scientists use to investigate and build models and theories of the world around them or that engineers use as they build and design systems. The practices are essential for all students to learn and are as follows:

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;

3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations for science and designing solutions for engineering;
7. Engaging in argument from evidence; and
8. Obtaining, evaluating, and communicating information.

Crosscutting Concepts (*as found in NGSS*)

The seven crosscutting concepts bridge disciplinary boundaries and unit core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas, and develop a coherent, and scientifically based view of the world. The seven crosscutting concepts are as follows:

1. *Patterns.* Observed patterns of forms and events guide organization and classification, and prompt questions about relationships and the factors that influence them.
2. *Cause and Effect: Mechanism and Explanation*. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.
3. *Scale, Proportion, and Quantity.* In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.
4. *Systems and System Models.* Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.
5. *Energy and Matter: Flows, Cycles, and Conservation.* Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.
6. *Structure and Function.* The way in which an object or living thing is shaped and its substructure determines many of its properties and functions.
7. *Stability and Change.* For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

Disciplinary Core Ideas (*as found in NGSS*)

The disciplinary core ideas describe the content that occurs at each grade or course. The K-12 Science Indiana Academic Standards focus on a limited number of core ideas in science and engineering both within and across the disciplines and are built on the notion of learning as a developmental progression. The Disciplinary Core Ideas are grouped into the following domains:

- Physical Science (PS)
- Life Science (LS)
- Earth and Space Science (ESS)

- Engineering, Technology and Applications of Science (ETS)

While the Indiana Academic Standards establish key expectations for knowledge and skills and should be used as the basis for curriculum, the standards by themselves do not constitute a curriculum. It is the responsibility of the local school corporation to select and formally adopt curricular tools, including textbooks and any other supplementary materials, that align with Indiana Academic Standards. Additionally, corporation and school leaders should consider the appropriate instructional sequence of the standards as well as the length of time needed to teach each standard. Every standard has a unique place in the continuum of learning, but each standard will not require the same amount of time and attention. A deep understanding of the vertical articulation of the standards will enable educators to make the best instructional decisions. These standards must also be complemented by robust, evidence-based instructional practices to support overall student development. By utilizing strategic and intentional instructional practices, other areas such as STEM and employability skills can be integrated with the content standards.

Acknowledgments

The Indiana Department of Education appreciates the time, dedication, and expertise offered by Indiana's K-12 educators, higher education professors, representatives from business and industry, families, and other stakeholders who contributed to the development of the Indiana Academic Standards. We wish to specially acknowledge the committee members, as well as participants in the public comment period, who dedicated many hours to the review and evaluation of these standards designed to prepare Indiana students for success after graduation.

References

- National Research Council. 2012. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165.
- NGSS Lead States. 2013. *Next Generation Science Standards: For States, By State*s. Washington, DC: The National Academies Press.

How to Read the Indiana Academic Standards for K-12 Science

Standard Number **Title** The title for a set of performance expectations is not necessarily unique and may be reused at several different grade levels.

Students who demonstrate understanding can:

Standard Number

Essential

Performance Expectation: A statement that combines practices, core ideas, and crosscutting concepts together to describe how students can show what they have learned. [Clarification Statement: A statement that supplies examples or additional clarification to the performance expectation.]

Science and Engineering Practices

Science and Engineering Practices are activities that scientists and engineers engage in to either understand the world or solve the problem.

There are 8 practices. These are integrated into each standard. They were previously found at the beginning of each grade level content standard and known as SEPs.

Connections to the Nature of Science

Connections are listed in either practices or the crosscutting concepts section.

Disciplinary Core Ideas

Disciplinary Core Ideas are concepts in science and engineering that have broad importance within and across disciplines as well as relevance in people's lives.

To be considered core, the ideas should meet at least two of the following criteria and ideally all four:

- Have broad importance across multiple sciences or engineering disciplines or be a key organizing concept of a single discipline.
- Provide a key tool for understanding or investigating more complex ideas and solving problems.
- Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge.
- Be teachable and learnable over multiple grades at increasing levels of depth and sophistication.

Disciplinary ideas are grouped in four domains: the physical sciences; the life sciences; the earth and space sciences; and engineering, technology, and applications of science.

A disciplinary core idea is identified as "(secondary)" when the other featured disciplinary core ideas connect to the science and engineering practices and crosscutting concepts as the main focus of the performance expectation.

A boundary statement, where applicable, provides guidance regarding the scope of a performance expectation.

Crosscutting Concepts

Crosscutting concepts are seven ideas such as Patterns and Cause and Effect, which are not specific to any one discipline but cut across them all.

Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas.

Connections to Engineering, Technology and Applications of Science

- These connections are drawn from either the Disciplinary Core Ideas or Science and Engineering Practices.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-PS2-1 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

3-PS2-1 **Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.** [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and balanced forces pushing on a box from both sides will not produce any motion at all.]

Essential

Science and Engineering Practices

SEP.3: Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

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Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Science investigations use a variety of methods, tools, and techniques.

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.)

PS2.B: Types of Interactions

- Objects in contact exert forces on each other.

Crosscutting Concepts

CC.2: Cause and Effect

- Cause and effect relationships are routinely identified.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-PS2-2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

3-PS2-2 **Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.** [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a seesaw.]

Science and Engineering Practices

SEP.3: Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

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Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns.

Disciplinary Core Ideas

PS2.A: Forces and Motion

- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)

Crosscutting Concepts

CC.1: Patterns

- Patterns of change can be used to make predictions.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-PS2-3 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

3-PS2-3 **Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.** [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause-and-effect relationships could include how the distance between objects affects strength of the force, and how the orientation of magnets affects the direction of the magnetic force.]

Science and Engineering Practices

SEP.1: Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions that can be investigated based on patterns such as cause and effect relationships.

Disciplinary Core Ideas

PS2.B: Types of Interactions

- Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

Crosscutting Concepts

CC.2: Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-PS2-4 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

3-PS2-4 **Define a simple design problem that can be solved by applying scientific ideas about magnets.** [Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]

Science and Engineering Practices

SEP.1: Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Define a simple problem that can be solved through the development of a new or improved object or tool.

Disciplinary Core Ideas

PS2.B: Types of Interactions

- Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

Crosscutting Concepts

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-LS1-1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

3-LS1-1 **Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.** [Clarification Statement: Changes organisms go through during their life form a pattern.]

Essential

Science and Engineering Practices

SEP.2: Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop models to describe phenomena.

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Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns.

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.

Crosscutting Concepts

CC.1: Patterns

- Patterns of change can be used to make predictions.

3-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

3-LS2-1 **Construct an argument that some animals form groups that help members survive.**

Science and Engineering Practices

SEP.7: Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence, data, and/or a model.

Disciplinary Core Ideas

LS2.D: Social Interactions and Group Behavior

- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.

Crosscutting Concepts

CC.2: Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-LS3-1 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

3-LS3-1

Essential

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.]

Science and Engineering Practices

SEP.4: Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning.

Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents.

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information.

Crosscutting Concepts

CC.1: Patterns

- Similarities and differences in patterns can be used to sort and classify natural phenomena.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-LS3-2 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

3-LS3-2 **Use evidence to support the explanation that traits can be influenced by the environment.** [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and a pet dog that is given too much food and little exercise may become overweight.]

Science and Engineering Practices

SEP.6: Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., observations, patterns) to support an explanation.

Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.

LS3.B: Variation of Traits

- The environment also affects the traits that an organism develops.

Crosscutting Concepts

CC.2: Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-LS4-1 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

3-LS4-1 **Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.** [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.]

Science and Engineering Practices

SEP.4: Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning.

Disciplinary Core Ideas

LS4.A: Evidence of Common Ancestry and Diversity

- Some kinds of plants and animals that once lived on Earth are no longer found anywhere.
- Fossils provide evidence about the types of organisms that lived long ago and about the nature of their environments.

Crosscutting Concepts

CC.3: Scale, Proportion, and Quantity

- Observable phenomena exist from very short to very long time periods.

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Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-LS4-2 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

3-LS4-2 **Essential**	**Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.** [Clarification Statement: Examples of cause-and-effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

Science and Engineering Practices

SEP.6: Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., observations, patterns) to construct an explanation.

Disciplinary Core Ideas

LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

Crosscutting Concepts

CC.2: Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-LS4-3 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

3-LS4-3 **Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.** [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]

Science and Engineering Practices

SEP.7: Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence.

Disciplinary Core Ideas

LS4.C: Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Crosscutting Concepts

CC.2: Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-LS4-4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

3-LS4-4 **Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.** [Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.]

Science and Engineering Practices

SEP.7: Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. *(secondary)*

LS4.D: Biodiversity and Humans

- Populations live in a variety of habitats and change in those habitats affects the organisms living there.

Crosscutting Concepts

CC.4: Systems and System Models

- A system can be described in terms of its components and their interactions.

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Connections to Engineering, Technology, and Applications of Science

Interdependence of Engineering, Technology, and Science on Society and the Natural World

- Knowledge of relevant scientific concepts and research findings is important in engineering.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-ESS2-1 Earth's Systems

Students who demonstrate understanding can:

3-ESS2-1 **Essential**

Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.]

Science and Engineering Practices

SEP.4: Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.

Disciplinary Core Ideas

ESS2.D: Weather and Climate

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.

Crosscutting Concepts

CC.1: Patterns

- Patterns of change can be used to make predictions.

3-ESS2-2 Earth's Systems

Students who demonstrate understanding can:

3-ESS2-2 **Obtain and combine information to describe climates in different regions of the world.**

Science and Engineering Practices

SEP.8: Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

- Obtain and combine information from books and other reliable media to explain phenomena.

Disciplinary Core Ideas

ESS2.D: Weather and Climate

- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.

Crosscutting Concepts

CC.1: Patterns

- Patterns of change can be used to make predictions.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-ESS3-1 Earth and Human Activity

Students who demonstrate understanding can:

3-ESS3-1 **Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.** [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lighting rods.]

Science and Engineering Practices

SEP.7: Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Disciplinary Core Ideas

ESS3.B: Natural Hazards

- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. *(Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)*

Crosscutting Concepts

CC.2: Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change.

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Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones).

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Connections to Nature of Science

Science is a Human Endeavor

- Science affects everyday life.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-5-ETS1-1 Engineering Design

Students who demonstrate understanding can:

3-5-ETS1-1 **Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.**

Science and Engineering Practices

SEP.1: Asking Questions and Defining Problems

Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

Crosscutting Concepts

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- People's needs and wants change over time, as do their demands for new and improved technologies.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-5-ETS1-2 Engineering Design

Students who demonstrate understanding can:

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Science and Engineering Practices

SEP.6: Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.

Disciplinary Core Ideas

ETS1.B: Developing Possible Solutions

- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.
- At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.

Crosscutting Concepts

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.

3-5-ETS1-3 Engineering Design

Students who demonstrate understanding can:

3-5-ETS1-3 **Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

Science and Engineering Practices

SEP.3: Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

Disciplinary Core Ideas

ETS1.B: Developing Possible Solutions

- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.

ETS1.C: Optimizing the Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Note: Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts appear as defined in the Next Generation Science Standards.